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Office of Statewide Health Planning and Development

PRELIMINARY REPORT

EVALUATION OF THE 2003 MODEL BUILDING CODES

June 11, 2003

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BACKGROUND

OSHPD Authority

The Office of Statewide Health Planning and Development (OSHPD) is the adopting and enforcing agency for the California Building Standards Code, Title 24, California Code of Regulations (CCR), with application to Hospitals, Skilled Nursing Facilities, Correctional Treatment Facilities, and Licensed Clinics. OSHPD has the authority to amend the adopted model building code as necessary to achieve the performance objectives defined in the Alfred E. Alquist Hospital Facilities Seismic Safety Act. OSHPD also promulgates administrative code provisions within Part 1, Title 24, CCR pertaining to enforcement of building standards.

Overview

The purpose of the building code is to provide for public safety, through an efficient and consistent set of rules for construction. The building code is not a design manual or a construction guide. Vague or contradictory language, rather than providing flexibility, in fact causes confusion and delays, as designers, contractors and building officials struggle to determine the meaning and intent of the code. In adopting a model code, the enforcing agency reviews and coordinates the code, amending it as necessary to meet its statutory requirements and eliminate conflicts and ambiguities.

OSHPD has evaluated the 2003 *NFPA 5000 Building Construction and Safety Code (NFPA 5000)* and the 2003 *International Building Code (IBC)* for adoption as the base document for 2004 *California Building Code (CBC)*. As part of the evaluation, OSHPD considered the structural and non-structural aspects of design and construction, as well as architectural and fire & life-safety provisions that affect structures regulated by OSHPD.

OSHPD has used a three-phase approach to our evaluation.

1. We have reviewed the level of safety provided by the model codes:
   - Compared to the current level of safety provided by the 2001 *CBC*, and
   - Compared to each other.

2. We have evaluated the amount of work needed to amend the codes as required for the design and review of health care facilities, considering:
   - The amendments needed to maintain the current level of safety,
   - The ease with which necessary amendments can be made, both through the model code development process and through California amendments,

- The use of referenced standards and publications, and the methods for resolving conflicts between referenced standards and the code, and the methods for resolving conflicts between different referenced standards and publications,
- The amount of work required to review and update Policy Intent Notices (PINs), Code Application Notices (CANs) and other documents.

3. We have evaluated the ease of use of the two model codes from both a design perspective and from a plan review/construction inspection point of view, including:
   - Consideration of the effort that will be required by OSHPD staff and local building officials to understand and enforce the code (local building departments are responsible for enforcement of licensed clinic regulations that OSHPD promulgates). This includes training needed to become proficient in the use of the code, in order to assure correct interpretation and to minimize the impact on plan review turnaround times,
   - Review of the types of support programs offered by ICC and NFPA.
   - Review the clarity and ease of use of the code for architects, engineers and other professionals involved in health care facility construction.

Evaluation Process

To perform our evaluation, OSHPD staff has:

- Performed a comparative review of the model codes and the 2001 CBC,
- Attended training presented by NFPA and the International Code Council (ICC),
- Reviewed code evaluation criteria suggested by interested parties,
- Attended public meetings held under the auspices of the California Building Standards Commission, State Fire Marshal and Division of the State Architect to hear testimony of interested parties,
- Reviewed code comparisons, summaries, and recommendations presented by individuals and professional organizations, and
- Requested clarification on different aspects of the model codes from both NFPA and ICC. The questions posed to the model code organizations and their responses are found in Attachment A (NFPA) and Attachment B (ICC).

OSHPD Review Team

OSHPD technical staff participated in the review of the model code documents through various state and local organizations, including the NFPA, ICC, ICBO, American Society of Civil Engineers (ASCE), Building Seismic Safety Council (BSSC), National Earthquake Hazard Reduction Program (NEHRP), the Structural Engineers Association of California (SEAOC) and the California State Fire Marshal. A summary of their relevant affiliations is summarized below:

- Susan Botelho – Staff Services Manager III
  - Chief, Regulations Development Section
  - Past President, California Capitol Chapter, ICBO
- Byron “BJ” Foster – Fire/Life Safety Officer

- Tom Hale – Senior Structural Engineer
    - Co-chair of the SEAOC Central Seismology Committee
    - Past-chair of the State SEAOC Seismology Committee
    - Member of the BSSC/NEHRP 2003 Provisions Technical Subcommittees TS-3 Foundations and Geotechnical Considerations, and TS-12 Base Isolation and Energy Dissipation.
- Don Harris – Senior Architect
    - Member, NFPA 5000 Committee on Health Care Occupancies
    - Member Code 2000 partnership egress working group
- John Gillengerten – Senior Structural Engineer
    - Member, Provisions Update Committee (PUC), BSSC/NEHRP Provisions 1994-present
    - Chairman of the BSSC/NEHRP Provisions Technical Subcommittee TS-8, Nonstructural Components and Systems, 1997-present
    - Member, ASCE 7 Task Committee on Earthquake Loads, 1998-present
    - Member BSSC Code Resource Structural Committee (CRSC), 1997-present
    - Member, NFPA 5000 Committee on Structures and Construction
- Bill Staehlin – Supervising Structural Engineer
    - Current President, SEAOC
    - Past President, Structural Engineers Association of Central California (SEAOCC)
    - Member, ASCE 7 Task Committee on Earthquake Loads, 1998-present
- Chris Tokas – SB 1953 Program Manager
    - Past President, SEAOCC
    - Member, ASCE 7 Task Committee on Earthquake Loads
    - Past Chair, SEAOCC Seismology Committee
    - Chair, SEAOC Seismology Committee, 2001 to present
    - Member, International Building Code Structural Committee, 1998 - 2002

Limitations of Evaluation

The task of evaluating two new code sets for adoption is monumental. In order to reduce the task to a manageable size, given the time and staff constraints, the scope of our evaluation was limited, and a number of assumptions were made:

- OSHPD's evaluation is limited to the Building Code.
- Our review was qualitative in nature. Not every potential conflict and problem (or remedy) is covered in this evaluation.
- We did not specifically review the Fire Codes. However, we strongly suggest that the Building and Fire codes that are adopted by California should be from the same "family," since coordination of these two documents is critical.
- We performed a cursory review of the mechanical and plumbing codes. OSHPD proposes that the Uniform Mechanical and Plumbing Codes published by the International Association of Plumbing and Mechanical Officials (IAPMO) should remain the codes adopted by California.

- We did not specifically review the electrical code. The National Electrical Code published by NFPA should remain the electrical code adopted by California.

EVALUATION

1. Level of Safety Provided by Model Codes

Regional versus National Code

The 2001 *CBC* encompasses over half a century of incremental improvements in the *Uniform Building Code (UBC)*. The *UBC* and *CBC* provisions have been developed in response to unique regional conditions, including California's high level of seismic activity. In contrast, both the *IBC* and *NFPA 5000* codes represent efforts to develop a single code to be used throughout the nation. As such, they differ significantly from the 2001 *CBC*, in some areas being more conservative, in others less.

Architectural Provisions

In examining the level of safety provided by the proposed model codes compared to the current *CBC*, both the *IBC* and *NFPA 5000* offer substantially reduced levels of protection than are currently enjoyed under the *CBC*. This reduction is primarily due to tradeoffs in the *IBC* and *NFPA 5000* for fire sprinklers, and increased allowable heights and areas in these codes.

Another major reduction in the level of protection for hospitals and skilled nursing facilities in both the *IBC* and *NFPA 5000* compared to the CBC is the allowance of non-fire-rated corridors in hospitals and skilled nursing facilities protected with fire sprinklers. However, *NFPA 5000* goes even farther in Section 19.3.6.1(1), allowing spaces of unlimited area to be open to the corridor, provided they are not used for patient sleeping rooms, treatment rooms or hazardous areas. This would allow hospitals with virtually no walls, except for a few specific types of rooms and smoke barrier walls.

A significant difference that will affect buildings under OSHPD's jurisdiction is that *NFPA 5000* treats ambulatory healthcare occupancies (clinics) as business occupancies with regard to height and area. This allows surgical clinics in buildings that are much larger and taller than the current CBC allows, and even larger than the *IBC* would allow.

Structural Provisions

The structural provisions of *IBC* and *NFPA 5000* follow a developing trend that began with the 1997 *UBC*. In the 1997 *UBC*, the National Earthquake Hazard Reduction Program *Recommended Provisions for Seismic Regulations for New Buildings* (*NEHRP Provisions*) became the technical basis for the seismic design provisions of the *UBC*, replacing the recommended seismic provisions promulgated by the Structural Engineers Association of California.

The seismic design methodology, upon which both the *IBC* and *NFPA 5000* are based, is dramatically different from that in 2001 *CBC*. The concept of seismic zones, which divided the state into two levels of risk, has been replaced with contour maps showing expected ground shaking intensity. Since all of California was classified in seismic zones 3 or 4 (the areas of highest risk), building systems like unreinforced masonry (URM), which have historically performed very poorly in earthquakes, were prohibited.

As a result of the new seismic hazard mapping approach used in the *IBC* and *NFPA 5000*, earthquake design lateral force levels now vary dramatically from one part of the state to another. In the 2001 *CBC*, the difference between design force levels between regions of highest and lowest seismic activity in California was a factor of 2. Under either proposed code, the difference will be a factor of 8 to 10. The proposed codes will allow the reintroduction of low ductility structural systems (such as unreinforced concrete and URM), which have not been permitted in California for 70 years. We believe that this is an unintended consequence of the change in seismic design procedures, reflected by the fact that there are currently code change proposals under consideration for the 2003 edition of the *NEHRP Provisions* that will restrict the use of the low ductility systems in areas of moderate seismicity nationwide, including areas of California. However, even if these proposals are successful, it will be at least 3 years before the changes are reflected in *ASCE 7-05 Minimum Design Loads for Buildings and Other Structures* (2005 edition), the primary source document for seismic design used by both model codes. In the interim, state and local enforcement agencies will have to amend the code to restrict the use of these low-ductility building systems.

The practice of tying seismic detailing and design requirements to seismic zone has been abandoned. Seismic design requirements are now tied directly to the type of lateral force resisting system in the building. For example, the design and detailing requirements of a steel special moment frame building are the same whether the building is constructed in Los Angeles or Oklahoma City.

The use of certain structural systems is limited by the Seismic Design Category (SDC) of the building, which is a function of ground shaking potential and occupancy. All buildings in the same SDC are subject to the same general requirements. For example, the structural system of a hospital in Sacramento (Seismic Design Category D) will be designed to the same seismic requirements as a grocery store in San Diego (also Seismic Design Category D).

Regardless of which model code is chosen, significant amendments to the structural provisions of the code will be needed if the current level of safety in the 2001 *CBC* is to be maintained.

2. Ease of Amending the Code

Reference Standards and Publications

The *IBC* uses referenced standards to cover some aspects of building construction. *NFPA 5000* uses referenced publications to cover many aspects of building construction, and nearly all aspects of structural design. Both codes reference these documents rather than include the text of the design requirements directly in the code. This is a departure from the 2001 *CBC*, where most of the requirements for design were contained directly in the code, and any amendments are clearly shown in the context of the code language. In both *IBC* and *NFPA 5000*, much of the text commonly associated with structural design provisions has been replaced, in whole or in part, by references to *ASCE 7-02, Minimum Design Loads for Buildings and Other Structures. IBC* relies on referenced standards for steel and concrete design. In *NFPA 5000*, reliance on referenced publications is almost complete for all materials.

Although much progress as been made in coordinating the various referenced standards at the national level, there are still numerous conflicts and inconsistencies. These conflicts arise from a number causes, not the least of which is the fact that update and development cycles of the various referenced documents are not coordinated. In order for a building code to be easily usable and enforceable, the inconsistencies and conflicts must be resolved. If they are not resolved by the model code promulgating organization, then the adopting agency must use its resources to resolve conflicts.

In general, it is significantly more difficult to amend and use codes that make heavy use of referenced standards. The user must jump from standard to standard during the course of design or review. In addition, amended referenced standards can be difficult to use, because the code contains only the amendment, and the text of the referenced standard is generally not reproduced in the code. Hence, the user must first be aware that the standard has been amended, and then put the amendment into the proper context. The likelihood of errors is greatly increased. *NFPA 5000*, with its' complete reliance on referenced publications, will be more difficult to amend and use.

While *IBC* uses reference standards, *NFPA 5000* uses reference publications. The distinction is important. Referenced standards are likely to be written in concise, enforceable language. In contrast, the referenced publications in NFPA, while including many of the same referenced standards found in the IBC, also includes a significant number of guidelines and manuals. Although incorporated into NFPA 5000 by Section 2.1, the guidelines and manuals are typically neither concise nor enforceable.

The use of reference documents (standards or publications) puts a much greater burden on the bodies promulgating and adopting the model codes. The problem is

much greater in NFPA, due to the inclusion of guidelines and manuals into the code. In addition, conflicts between referenced standards are more difficult to identify in *NFPA 5000*, where standards are only referenced, compared to the *IBC*, where some of the text of the referenced standards is repeated in the model code.

Resolving Conflicts Between Referenced Documents

In order to produce an effective, usable code, the model code organizations must have an efficient mechanism in place to resolve conflicts between referenced documents. OSHPD has identified conflicts between referenced documents in both the *IBC* and *NFPA 5000*. It should be noted that due to staffing and time constraints, our review was limited, and it is expected that many more conflicts will be found during the code adoption process. We asked questions of both of the model code organizations on some of these conflicts, with two objectives: first, to determine how the apparent conflict can be resolved in the context of the code as written and second, to determine what mechanisms are used by the organization to deal with conflicting reference documents in the code development process. The relationship between the code and the referenced documents, and the manner in which conflicts between referenced documents are resolved, appears to be fundamentally different in the *IBC* and *NFPA 5000*.

The seismic design provisions of *ASCE 7-02* provide an illustration of the differences between the two model codes, and the importance of this issue. *ASCE 7-02* refers to specific sections in specific editions of the materials standards for steel, concrete, and masonry design. Without these specific references, the seismic design provisions of *ASCE 7-02* are not readily usable. Different editions of the same standards are not interchangeable. A conflict exists when the model code makes reference to a specific edition of a material standard (for example, the 2002 edition of the masonry design standard), and *ASCE-7-02* refers to a different edition of the same referenced standard (for example, the 1999 edition of the masonry design standard).

In the *IBC*, secondary standards that are cited within a referenced standard (for example, the masonry design standard *ACI 530-99* referenced within *ASCE 7-02*) are considered part of the code (Attachment B, Question 7). This allows *ASCE 7-02* to be used in a consistent manner, since the reference standards in *ASCE 7-02* are enforceable.

In contrast, NFPA states that in general, secondary and tertiary referenced documents are not considered part of the NFPA code. This renders *ASCE 7-02* unusable without substantial amendment, since the material standards referenced therein, which are vital to the use of the document, are not valid references. Further, NFPA shifts the burden of sorting out the enforceability of secondary and tertiary references onto the building official (Attachment A, response to Structural Question 6, page 17 of 22). This position is reiterated on Attachment A, page 18 of 22, 3rd paragraph, where NFPA, speaking of conflicts between the different editions of the

masonry design codes states "…as part of the review process, California will want to compare the seismic provisions of *ACI 530-99* with *ASCE 7-02*'s modifications to those of *ACI 530-02* to determine if there are conflicts and how best to deal with those conflicts."

The process of identifying and then resolving these types of conflicts will require a significant staff effort and a large number of California amendments. The problem is acute with *NFPA 5000*, since that code relies almost entirely on referenced publications, many of which are not written in concise or enforceable language. While there are also potential conflicts in the *IBC*, ICC has taken a position on precedence that provides a framework to resolve conflicts.

Amendment of Referenced Standards
Another fundamental difference between the ICC and NFPA deals with their approach to amending referenced standards during the model code development process. The *IBC* routinely amends referenced standards to eliminate conflicts or to meet performance objectives of the code (for example, see chapters 19 and 21 of the 2003 *IBC*). While conflicts still exist in the *IBC*, there is a mechanism for resolving conflicts between referenced standards when they are identified in the code development process.

In contrast, NFPA technical committees may take one of several approaches in response to the conflict (Attachment A, Structural Questions 3b, page 15 of 22; Question 5, page 16 of 22): they may decide to accept the "differences" (i.e. accept conflicting provisions), they may adjust criteria in *NFPA 5000* not to conflict (i.e. amend *NFPA 5000*), or they may submit a proposed change to the referenced publication in its' next revision cycle (i.e. accept conflicting provisions, but attempt to get the "owners" of the referenced publications to resolve the difficulty). The first approach builds a conflict into the code. The second approach, (where the conflict is resolved in *NFPA 5000*) appears to have been rarely employed in the structural chapters. The third approach could take years to resolve, and even then the publisher of the referenced document may choose not to make the change. As noted above, this leaves the task of identifying and correcting conflicts in the referenced standards to California (Attachment A, response to Structural Question 6 sub-bullet, page 18 of 22).

Compared to the *IBC*, it will take significantly more effort to amend the structural provisions of the *NFPA 5000* code to eliminate apparent conflicts between the code and referenced standards and provide a level of safety equivalent to that found in the 2001 *CBC*.

Code Format
Although the technical content of the *IBC* is different from the *CBC* in many areas, the format of the *IBC* is similar to the *CBC*. This will make it easier to move existing California amendments to the *IBC* and find appropriate places for new amendments.

The format of *NFPA 5000* is very different from the current *CBC*, which will make the task of amending it more difficult.

Another difference with the NFPA format that will increase the difficulty of writing amendments (and increase the confusion of using the code) is NFPA's policy regarding exceptions. The NFPA *Manual of Style* does not permit exceptions when it is possible to word the text as requirements. This sometimes results in confusing or contradictory code requirements. For example, *NFPA 5000* Section 19.1.1.4.1.2 states that "doors…shall normally be kept closed," and Section 19.1.1.4.1.3 says, "doors…shall be permitted to be held open if they meet the requirements of 19.2.2.2.7." On face value, the two sections seem to contradict each other, but the second is really an exception to the first.

In spite of their written policy severely limiting the use of exceptions, the *NFPA 5000* makes liberal use of exceptions in some chapters (See *NFPA 5000*, Chapter 15 Building Rehabilitation – 124 exceptions in 19 pages – and Chapter 16 Assembly Occupancies – 87 exceptions in 16 pages).

In response to our question regarding the policy on exceptions, (see Attachment A, page 9 of 22, question 10), NFPA stated, "NFPA staff has never encountered code text that cannot be effectively expressed in the form of requirements without the use of exceptions. There should never be a case where the 'exception' format is needed. Rather, there is a big need for careful code wording so as to avoid apparent conflicts."

Architectural Amendments
Since both the model codes seem to provide roughly equivalent levels of protection (with some exceptions), we believe they will require a comparable number of amendments to bring either code to the level of the current *CBC*. However, as noted above, the organization and style of *NFPA 5000* will make the amendment process more difficult.

A significant investment of time and energy will be required to update various OSHPD documents (PINs, CANs, FREER Manual, reference materials) to coordinate with either new code. The *IBC* will require the least time for this process, again because of the different format of *NFPA 5000*.

3. Ease of Use of the Code

Structural Issues

Both *NFPA 5000* and *IBC* reference documents that conflict with the requirements of *ASCE 7-02*.

In the case of the *IBC*, this includes the 2002 editions of three standards: the masonry design standard, *ACI 530-02*; the concrete design standard *ACI 318-02;* and the steel design standard, *AISC 341-02*. *ASCE 7-02* references and amends the 1999 editions of all three standards. The conflicts will require coordination efforts on the part of the enforcing agency.

The coordination effort required for the concrete and steel chapters (Chapters 19 and 22) of the *IBC* appears manageable, since the technical changes in the standards were minor, and the new editions are organized such that cross referencing is still relatively straight forward.

Chapter 21 of the *IBC* contains extensive provisions for masonry, but also references *ACI 530-02*. There have been substantial technical changes between the 1999 and 2002 editions of ACI 530 that must be reviewed. Our review of Chapter 21 indicates that in general, the references between *ACI 530-02* and *IBC* have been coordinated. This will somewhat ease the technical correlation effort.

Chapter 23 of the *IBC*, covering wood construction, is a comprehensive presentation of wood design. Compared to the 2001 *CBC*, the chapter is better organized, more concise, and very usable. *IBC* Chapter 23 contains requirements for both engineered and conventional construction.

NFPA 5000's handling of material standards is less effective than that of the *IBC*. *NFPA* 5000 also references the 2002 editions of steel, concrete, and masonry standards. As with the *IBC*, the steel and concrete chapters, while containing some conflicts, appear to be manageable.

The masonry design provisions present a greater challenge. Aside from the *ACI 530-02*, there is little in the way of masonry requirements provided. Further, unlike the IBC, there was no apparent effort to coordinate section references between the structural design and masonry standards.

The wood design chapter in *NFPA 5000* (Chapter 45) appears to be unenforceable as written. Chapter 45 contains references to material and design standards, and durability provisions. In the 2001 CBC, wood frame construction is designed using the Allowable Stress Design method. The corresponding provisions in *NFPA 5000* consist of a reference to the American Forest Products and Paper Association (AF&PA) *Allowable Stress Design (ASD) Manual for Engineered Wood Construction*.

The *ASD* manual referenced in *NFPA 5000* actually consists of six documents: the manual itself; the 2001 *National Design Specification (NDS)* for wood and a supplement volume to the *NDS*; a supplement volume covering lumber, glu-lam beams, poles, shear walls, and diaphragms; a supplement volume titled *Special Design Provisions for Wind and Seismic*; and a volume of guidelines covering I-joists, composites, trusses, and metal connectors. The ASD manual, which is the

primary referenced document, is an excellent resource for designers. It is not an enforceable code document. It contains examples, “featured projects” like a fast food restaurant, a warehouse, a reservoir cover, etc., and is more in the form of a textbook and guide than a building code. The 2001 *NDS* and *NDS* supplement are written in an enforceable style. The volume on special design for wind and seismic is written in somewhat enforceable style, but the requirements are not incorporated into the manual (the primary referenced document) in an enforceable manner, and it contains material that duplicates and some cases conflicts with the requirements in other volumes. No order of precedence is established amongst the various volumes.

For conventional construction provisions, *NFPA 5000* references the AF&PA *Wood Frame Construction Manual for One and Two Family Dwellings*, 2001 edition. Although it is an ANSI accredited standard, this two-volume set is also a mixture of enforceable and unenforceable language. The actual conventional construction requirements are scattered throughout the text, interspersed with narrative, design aids, etc. Further, the standard is narrowly scoped to apply only to one and two-family dwellings, and would therefore be inappropriate for use on hospital, licensed clinic, or skilled nursing facilities projects. Nothing in *NFPA 5000* covers conventional construction requirements for buildings under OSHPD’s jurisdiction.

There are other referenced publications in the wood chapter that do not appear to be enforceable, such as the AF&PA *Load and Resistance Factor Design (LRFD) Manual for Engineered Wood Construction* and the Southern Pine Council *Wood Foundations Design & Construction Guide.*

OSHPD adopts *CBC* Appendix Chapter 33 on site grading. There are corresponding provisions in Appendix J of the *IBC*. There are no corresponding provisions in *NFPA 5000*.

Training
The amount of training that will be necessary with the adoption of either model code was also considered. There are substantial technical changes in both codes, requiring a significant amount of training to become familiar these new provisions. From a structural perspective, both designers and building officials will require extensive training on all the referenced standards.

The IBC is organized along the same general lines as the 2001 *CBC*, so the format will be familiar to most users. *NFPA 5000* follows an entirely different format, and additional training will be required to become familiar with this new format. On the whole we have determined that *NFPA 5000* will require more extensive training to properly apply.

Performance-Based Design
NFPA 5000 includes provisions for performance-based design, which allows more flexibility for designers, but greatly increases the amount of work needed to design,

review and approve projects utilizing this method. The performance-based design requirements contain requirements that appear vague and unenforceable. For example, the criteria at the serviceability performance level include a structural requirement that "Structures shall not experience permanent deformation or deflection or deformation or deflection that is troubling to occupants or disruptive of building function." How would the phrase "troubling to occupants" be enforced? ICC has placed its requirements for performance-based design in a separate code document, which appears to be a much better approach.

"California Code"
The use of a code in California that is different from the one used in the other states is an issue that can significantly impact the cost of doing business in the state. Many owners and designers of health care facilities conduct business in more than one state. Using a building code in California that is radically different from the rest of the nation will impose a tremendous burden on building owners and their consultants. As of June 4, 2003, the *IBC* has been adopted by 26 states, and in various jurisdictions in 43 states. *NFPA 5000* has been adopted in only one city in the nation. If California adopts *NFPA 5000*, it will make the task of architects, engineers and hospitals that do business in California and other states much more difficult and costly.

Insufficient Development
Many building industry professionals feel the *NFPA 5000* code is not yet ready for widespread use. It is a brand new code, is presented in a format that has not been used for a modern building code, incorporates new concepts in building design, and has never been "tested" to demonstrate the effectiveness or usability of these new ideas.

One of our questions to both ICC and NFPA requested justification for the increased allowable heights and areas of buildings in both the *IBC* and *NFPA 5000*. In their response, NFPA states that the task group dealing with height and area requirements "set out to develop a new approach, grounded in scientific principles" rather than the "traditional height and area requirements…based primarily upon experience." At one point in the process, the task group "concluded there were still several unresolved issues surrounding this new approach…and it was simply not ready to be included in *NFPA 5000*. Instead, they substituted "heights and areas that are familiar to architects, engineers and code officials," that is, heights and areas virtually identical to those found in the *IBC*.

Support Services
With regard to support services (interpretations, evaluations, training), both organizations have promised to offer roughly equivalent support services. However, ICC has all of their support services in place already, and they are familiar to designers, contractors, and building officials, through their experiences with ICBO. NFPA has promised to provide the same services, but many of them are not yet in

place, or are in their infancy. Therefore, there is insufficient data available to be able to evaluate the NFPA support services. In addition, while NFPA has extensive experience supporting the standards, they have no experience providing support for a building code.

Conclusion

There has been much debate about the influence of the model code development process on the quality of the final code document. ICC has been developed through a "governmental consensus" process that is familiar to users of the *UBC*. In this process, all changes to the code are approved by building officials. *NFPA 5000* is developed using their ANSI accredited consensus process, whereby proposed changes are reviewed by Technical Committees composed of industry representatives, government enforcers, consumers, business persons and others. Proposed changes are then submitted to a vote of the NFPA membership at the annual meeting. Both methods can produce useful and effective documents, but NFPA's reliance on the ANSI process severely limits their ability to effectively coordinate the host of referenced publications contained in the *NFPA 5000* code, since amendment of one ANSI document by another ANSI document is strongly discouraged.

While ICC is a new organization, combining the ICBO, BOCA and SBCCI code organizations, it is in many ways familiar to those who have worked in the ICBO process. The support services and technical expertise of these three organizations has been merged into the ICC. The *IBC* is a compilation of the three organizations' model building codes. Many decades of code development have been incorporated into the *IBC*, and it has been used throughout the country in the 2000 edition.

NFPA has a long history of standards development. Their documents are used as the industry standard for many types of fire protection systems. *NFPA 5000* is a new building code. Although based largely on *NFPA 101 Life Safety Code*, it has never been used in practice for the design or construction of buildings.

Both model codes will require amendments to maintain current height, area, and fire sprinkler requirements, and will require amendments to prevent the reintroduction of non-ductile structural systems into California. In the case of *NFPA 5000*, conflicts and omissions exist in the structural provisions that make the document extremely difficult to use in its current form. If adopted, these conflicts will have to be resolved at both the state and local levels. Unfortunately, local jurisdictions can only amend the code for specific climactic, geographic and topographic reasons, and the state agencies have limited authority for only their statutory jurisdiction. This will leave the local jurisdictions with a building code that contains known conflicts and unenforceable language. Local amendments cannot be adopted at the state level. Therefore, design requirements will vary considerably throughout local jurisdictions statewide.

Based on our analysis, the *IBC* represents the best choice for buildings under OSHPD jurisdiction, and, in our opinion, for the State of California.

- The *IBC* will require much less work to amend. While *NFPA 5000* could be amended to be workable, we estimate it will require double the effort on the part of OSHPD, compared to adoption of the *IBC*.

- The *IBC* is a familiar format, and will be readily accepted and by design professionals and building officials. The task of retraining for a new code will be minimized.

- Health and Safety Code Section 18930 (a)(9) (the 9-point criteria) requires that the State Fire Marshal (SFM) review all regulations proposed by State Agencies to determine if the regulation promotes fire or panic safety. Selection of *NFPA 5000*, with its need for extensive amendments, will generate a significant increase in workload at the SFM. This will almost certainly delay SFM's response to the state agencies, which will in turn delay the code adoption cycle.

- Given the limitations imposed by the current fiscal environment in state government, OSHPD is not able to quickly and efficiently handle the volume of work that adopting *NFPA 5000* would create.

- Selection of *NFPA 5000* will result in delays in design and review of projects, as people struggle to become familiar with an entirely different code format.

- The IBC provides a better structure in which to use referenced standards, and allows referenced standards to be amended within the model code to eliminate conflicts.

- The mixture of enforceable and unenforceable language found in portions of the structural provisions of *NFPA 5000*, rather than providing design flexibility, will cause confusion and delays to designers and enforcers, as they struggle to determine exactly what the code requires.

- Because the wood chapter in *NFPA 5000* is unenforceable as written, an entire group of structures under OSHDP jurisdiction (single story Skilled Nursing Facilities and many licensed clinics) cannot be constructed using *NFPA 5000* as written. This will require writing an entirely new chapter for wood design.

- If California adopts *NFPA 5000*, California's design and construction communities will be placed at a severe economic disadvantage when pursuing work outside California. Also, many designers, contractors and building owners in other states may be reluctant to initiate work within California, since working with a totally different building code from the rest of the nation would create economic and logistic difficulties.

- Finally, and perhaps most importantly, adopting the *IBC* will fulfill the stated intentions of both ICC and NFPA, in having a single building code that is applicable throughout the United States. This will greatly reduce the burden and frustration of interstate design and construction.